Zero Retries issue 0016 2021-10-29

Advanced Amateur Radio - Data Communications; Space; Microwave… the fun stuff! Nothing great has ever been accomplished without irrational exuberance - Tom Evslin. Irrational exuberance is pretty much the business model of Zero Retries - Steve Stroh N8GNJ The Universal Purpose of Ham Radio is to have fun messing around with radios - Bob Witte K0NR

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The Days Are Just *Packed*

Calvin said it best: THE DAYS ARE JUST ***PACKED***. (I'd include the relevant Calvin and Hobbes comic strip image, but I don't want a DMCA takedown applied to Zero Retries, so just click the link.)

I'm under the gun for some "time boxed" projects and that's intruded on my normal leisurely writing schedule for Zero Retries. Coincidentally, there have been a lot of interesting "Zero Retries Interesting" mentions of late, to the point of overflowing my bookmarking system for Zero Retries.

I use Pinboard to accumulate bookmarks across multiple systems, including my pocket computer, my tablet computer, laptop, and desktop. I know there are many others, but Pinboard works for me. For this issue, I'm going to combine a compressed writing window with an overflowing "Zero Retries Interesting" queue into a series of brief mentions.

The Orange **Near email length limit (!)** warning is appearing in the lower left corner… it feels like an old friend now. I packed as much into this issue as Substack would allow, but there was much more I would have liked to share with you, so I'll continue this "catch up" format next week in Zero Retries 0017.

Happy Halloween, folks!

Raspberry Pi Zero 2 W

In my opinion, one couldn't *do* better than the Raspberry Pi Zero W - a $10 computer that runs "real" Linux (or many other operating systems) with 512 MB of memory, essentially unlimited storage via Micro SD card or USB, a 1 GHz processor, amazingly rich hardware I/O, and built-in Bluetooth and Wi-Fi. If $10 was "too expensive", there is the Raspberry Pi Zero - that was $5 with no "W" (Wi-Fi or Bluetooth).

But then Raspberry Pi created the Raspberry Pi Pico, which is a micro*controller* that starts at *$4*. The stellar feature of the Pico is that Raspberry Pi Foundation created a version of Python for the Pico; Python usually requires a more complex computer like the Raspberry Pi 400, but with this development, you can learn / use Python on "high end" computers like the Raspberry Pi 400 and now all the way down to microcontrollers managing mundane tasks like monitoring whether you left the garage door open. That range of compatible systems using the same programming language is empowering for us programming dilettantes.

Raspberry Pi Zero 2 W - Photo courtesy of raspberrypi.com

Not content to leave it at *great*, Raspberry Pi Foundation just announced the Raspberry Pi Zero 2 W. Same form factor. Same capabilities. Slightly higher price - $15. For that additional $5, *you get 2x - 5x the performance*, depending on your code. My favorite explainer for all things Raspberry Pi is Jeff Geerling who does a great job of video explanations. (Unlike most YouTubers, Geerling just gets to the point and doesn't waste a lot of time with unnecessary *techsplaining*.) He seems to like the Raspberry Pi Zero 2 W.

Dire Wolf Implements new Forward Error Correction Technique

> Dire Wolf is a software "soundcard" AX.25 packet modem/TNC and APRS encoder/decoder. It can be used stand-alone to observe APRS traffic, as a tracker, digipeater, APRStt gateway, or Internet Gateway (IGate).

In correspondence with John Langner WB2OSZ, he has been experimenting with adding Improved Layer 2 Protocol (IL2P) forward error correction into Dire Wolf. This is in addition to the FX.25 forward error correction option already implemented in Dire Wolf. Forward Error Correction (FEC) is the "secret sauce" that makes digital voice systems such as D-Star and Digital Mobile Radio (DMR) a bit more usable than ordinary FM because FEC can correct some errors during transmission.

IL2P was developed by Nino Carrillo KK4HEJ for the Terrestrial Amateur Radio Packet Network (TARPN) project and the TARPN NinoTNC 9600A that was developed for TARPN to improve the reliability of links within TAPRPN. WB2OSZ developed the IL2P feature of Dire Wolf from the IL2P specification published by TARPN.

WB2OSZ's goal, as I understand it, is for radios running Dire Wolf and radios using a NinoTNC to be interoperable. I'm not very familiar with navigating within GitHub, but I think the "dev" branch of Dire Wolf that includes IL2P is here.

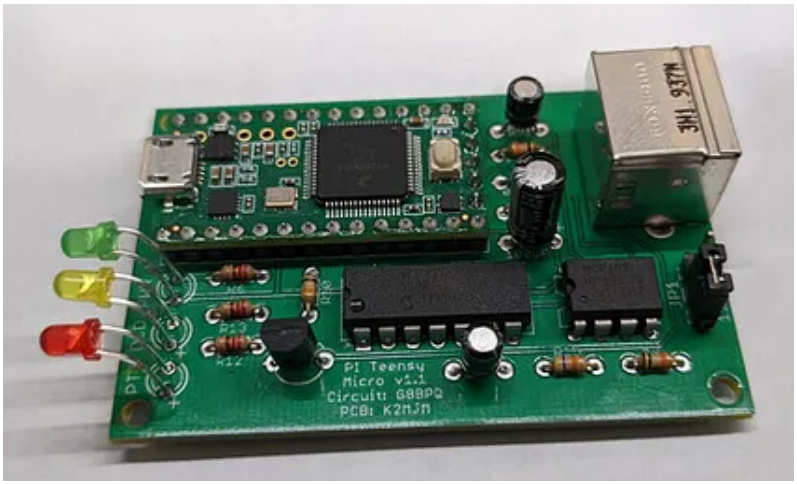
I think that implementing IL2P in Dire Wolf is laudable. My impression is that IL2P will be more efficient (lower overhead) than FX.25 because FX.25 was designed to "fall down" to interoperate with AX.25 stations, and IL2P is designed to be either on or off. This is because TARPN networks are designed as a series of point to point links; thus the two ends of a link are known in advance. If both ends are capable of IL2P, it makes sense to turn IL2P on 100% instead of trying to discern whether a radio that you're attempting to connect to has FX.25, or not.

I'm guessing that with the additional compute power of inexpensive computers like the Raspberry Pi 4, it will be trivial to run multiple decoders to "sense" the various systems on a channel, such as 1200 / 2400 / 3600 / 4800 / 9600 / FSK / AFSK / FEC yes / FEC no.

Kudos to WB2OSZ for keeping Amateur Packet Radio cool and interesting!

Prototype Pi Teensy Micro v1.1 TNC

Speaking of packet radio and TNCs, the evolution of the Terminal Node Controller (TNC) is ongoing. Witness the Pi Teensy Micro v1.1:



Prototype Pi Teensy Micro v1.1 - photo courtesy of Mat Murdock K2MJM

In an email message on 2021-09-22 to the RaspberryPi-4-HamRadio@groups.io list, Mat Murdock K2MJM showed off a prototype of a size-reduced version of the TNC-Pi9k6 TNC:

> Labor day, while preparing for an upcoming event I was messing around with my TNC's. I started thinking if it would be possible to shrink the TNC down. Well this was the result of it. It was a lot of fun actually. Seems to function properly... bonus. Now to design a case.

He had me at "messing around with my TNC's" :-) West Valley City Amateur Radio Club (WVCARC) builds TNC-Pi9k6 TNC kits as a fundraising project. Support information is here. (West Valley City is a suburb of Salt Lake City Utah… though you wouldn't know that from the club's otherwise informative website).

The TNC-96K TNC was designed by John Wiseman G8BPQ and briefly sold by Coastal Chipworks.

Kudos to K2MJM and the blessings of G8BPQ for encouraging this development.

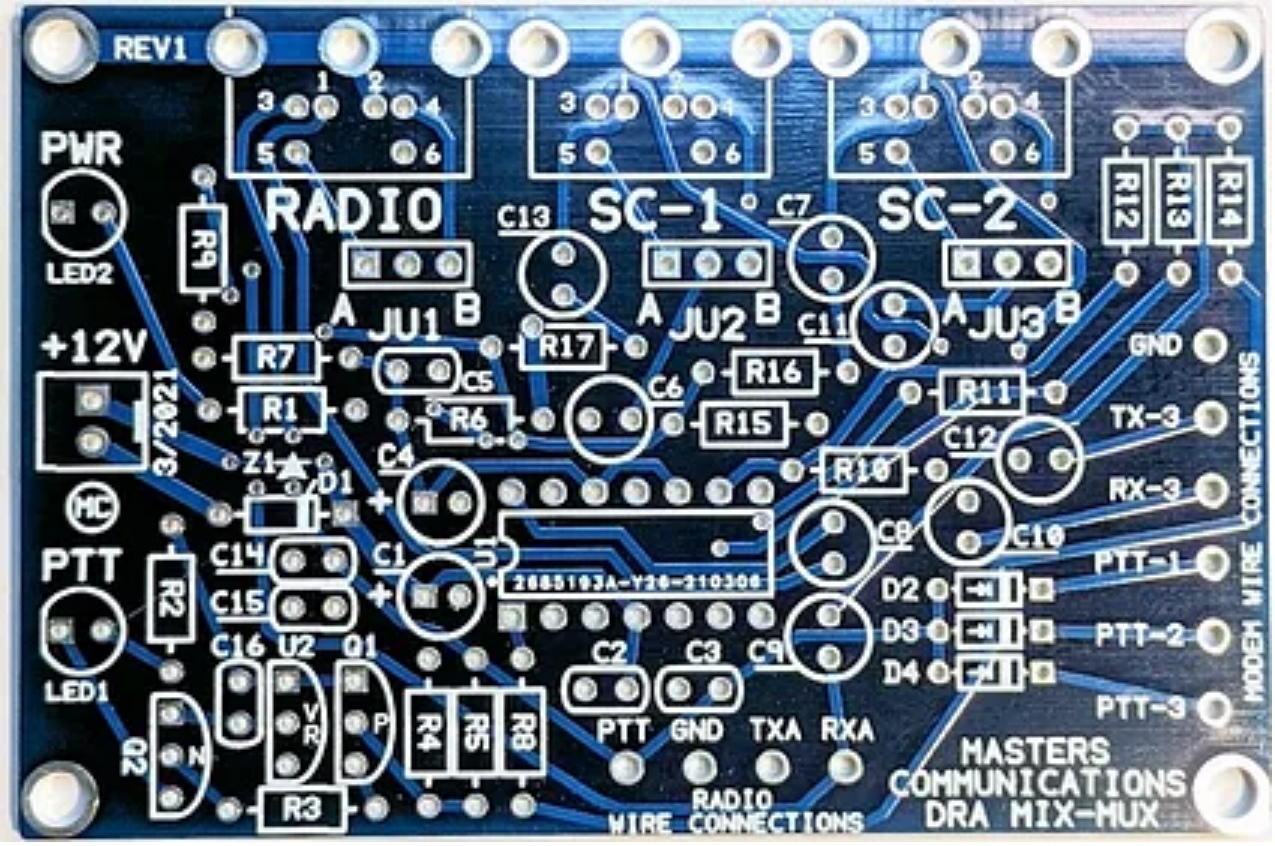
One of my long term Amateur Radio fantasies (not yet a real plan) at N8GNJ Labs is to create a massive very low power Packet Radio network within my shop that includes as many TNCs as I can reasonably incorporate, such as classic TNCs and newer units such as the NinoTNC 9600A, TNC-Pi9k6, and many others that I've accumulated over the years, er… decades. I'll probably keep the 1200 bps TNCs on 144-148 MHz and the 9600 bps TNCs on 440-450 MHz. I need to find some really inexpensive, low power radios for this project. The "computers" that the TNCs connect to will almost certainly be Raspberry Pi Zero Ws.

Masters Communications Model DRA-MIX-MUX

Another interesting email conversation on 2021-10-24 caught my attention on the VARA-MODEM email list - Winlink RMS Gateway using both Packet and VARA-FM with one radio.

> Does anyone know how to setup VARA-FM to coexist with Packet on VHF on a Winlink RMS Gateway with only one VHF radio? I made my 3-way cable harness to include a Kantronics 9612XE TMS (DB9 and a DB15), a DRA-36 Module (a 6-pin Mini DIN) and a 6-pin Mini DIN for VHF Radio. I am using only the 9600 pin on the DIN radio connector. 9600 is selected in the radio menu.

That conversation thread led to the mention of the very new Masters Communications Model DRA-MIX-MUX board:



Masters Communications DRA-MIX-MUX Board - Photo courtesy of Masters Communications

What is it - and why do I need it?
The DRA-MIX-MUX is used in instances where you want to connect different applications simultaneously to one radio using separate radio interfaces. This board allows DRA's or even older packet modems to be connected. Supports 1200 and 9600 baud operation, and high-speed (HS) SoundModem or licensed VARA FM. Up to three interfaces can be connected simultaneously to one radio. Two sound card ports (SC-1, and SC-2) and RADIO port accommodates the connection of Mini-DIN-6 cable(s) directly. The third modem connects to holes that allow direct wiring. The DIN-6 connectors can be left off for direct wiring of older modems on those ports. LED's indicate the presence of power and the assertion of PTT from any modem or sound card. Uses a high-performance TL074 op-amp and requires a source of power (12 VDC at less than 100mA - provided externally).

Masters Communications manufactures a number of very good audio adapters for sound card modes such as VARA FM, thus they *get* the subtle issues of such devices.

Kudos to Scott Currie NS7C who apparently provided the inspiration to Kevin Custer W3KKC of Masters Communications to design the DRA-MIX-MUX board.

ARRL Clean Signal Initiative

I'll admit this one slipped by me, so kudos to Dan Romanchik KB6NU for explaining the ARRL Clean Signal Initiative better than the original source:

> The CSI gets the ARRL formally in the "technical standards" business. (Other technical organizations already do it: IEEE, UL, ASTM, and SAE, and others.) The ARRL currently tests new products to informal standards, with no real hard benchmarks for manufacturers to meet, other than the minimal standards outlined in FCC Part 97.307.
>
> Creates and incorporates documented "best practice" standards and testing methodologies to ensure commercial amateur radio transmitters and amplifiers meet not only minimum FCC requirements for signal cleanliness, but push the envelope.

"Standardized Standards", as opposed to informal standards, or mere interoperability (my implementation works with the well-

regarded Unit X) are a good thing. It's good to see the ARRL wading back into standards work - AX.25 turned out pretty well; TAPR updated it to v2.2, which is the version we use now. Even better would be to apply the same technical standards approach to other areas such as the ubiquitous implementation of 1200 bps "Bell 202 Modems".

We May Soon Have a Fully Empowered FCC

Those of us watching the FCC for other than Amateur Radio purposes have been puzzled by President Biden's seeming indifference to date that a lot of activity at the FCC is stalled because there are only four FCC commissioners (two appointed by Democrats, two appointed by Republicans) and that often results in a stalemate.

The wait for President Biden to weigh in on staffing up the FCC is finally over:

- Acting Chairperson Jessica Rosenworcel was nominated as Chairperson and was renominated for a new term (her original term had expired),
- Gigi Sohn was nominated for the vacant FCC Commissioner position,
- Alan Davidson was nominated for the Administrator / Assistant Secretary for for National Telecommunications and Information Administration (NTIA).

I won't go into why these individuals are considered excellent picks (here's a telecom-centric perspective from someone I respect), but it's very encouraging to me that the FCC will soon be fully staffed and thus able to tackle issues that it's been unable to work on without a full commission.

I feel that with this FCC "at full strength" and with these competent people in place, this is going to be about the best "moment" that US Amateur Radio will have in the foreseeable future to accomplish a rules reform, such as not specifying data rates. I hope the movers and shakers in US Amateur Radio immediately begin working on advocating for Amateur Radio rules reform at the FCC.

Overview of DragonOS - Linux ISO with SDR Programs

RTL-SDR.com posted this interesting article on 2021-10-26:

> **TechMinds: Testing DragonOS Focal, a Linux ISO with many SDR programs built-in**
>
> In the past we've posted many times about DragonOS which is an Ubuntu Linux image that comes preinstalled with multiple SDR software packages. This takes the hassle out of needing to compile and install programs on Linux, some of which can often be very difficult and time consuming to get up and running. Aaron who is the creator of DragonOS also runs a YouTube channel where he provides multiple tutorials and demos of the software installed.
>
> This week on the Tech Minds YouTube channel, host Matt tests out DragonOS in a Virtual Machine and gives a broad overview of what DragonOS is capable of. He shows how to set up VMWare Workstation in order to create the virtual machine, installs Dragon OS, shows what programs are included and demonstrates a few programs in action.

I haven't had time to watch this video, but it's in my YouTube queue.

KrakenSDR - Multiple Updates

The KrakenSDR project (five-channel, RX-only, software-defined radio based on the RTL-SDR and designed for phase-coherent applications and experiments) has some impressive momentum behind it since I mentioned it in Zero Retries 0014. They've provided several updates since then - Update 1, Update 2, and Update 3.

Feedback Loop

I *really should know better* than to "shoot from the hip" with a flip remark like I made in Zero Retries 0015 where I said:

> I, personally, have zero interest in watching the Indianapolis 500 or any other vehicle racing, at least until they convert the vehicles to electric.

“Reader X” who prefers not to be attributed or quoted directly directed me to Formula E racing:

> Formula E brings racing tech to the road. With some of the biggest car and racing brands going head to head on the streets, Formula E is more than just a racing series - it's a battle for the future. Our cars, powered by pure electricity, pave the way for the cars of tomorrow.
> Welcome to the future. Welcome to Gen2.
> While the championship might be a few years old, the technology racing around the track is ever-changing. The Batmobile-esque all-electric racer has double the energy storage capacity of the Gen1 car, meaning it can complete a whole race, so no more mid-race car swaps. With 250kW of power, the Gen2 will accelerate from 0-100km/h in 2.8-seconds and go on to a top speed of 280km/h. Greater speeds, more action on track and with just one car per driver - there's everything to lose.

Thank you Reader X! Noted!

On the other hand, that flip remark led to this *very cool reply* from Martin Rothfield W6MRR:

> Speaking of racing self-driving cars - there is a community nearby racing these.
>
>
>
> Donkey Car example - Photo courtesy of donkeycar.com
>
> [Donkey Car is an] opensource DIY self driving platform for small scale cars. RC CAR + Raspberry Pi + Python (tornado, keras, tensorflow, opencv, ...) What can you do?
>
> - Build your own toy car that can drive itself.
> - Drive your car with your phone or laptop.
> - Record images, steering angles & throttles.
> - Train neural net pilots to drive your car on different tracks.
> - Race your car in a DIY Robocars race.
>
> Donkey is a Self Driving Car Platform for hobby remote control cars. Donkey Car is made up of several components:
>
> - It is a high level self driving library written in Python. It was developed with a focus on enabling fast experimentation and easy contribution.
> - It is an Open Source Hardware design that makes it easy for you to build your own car.
> - It is a simulator that enables you to use Donkey without hardware.
> - It is a community of enthusiasts, developers and data scientists that enjoy racing, coding and discussing the

future of ML, Cars and who will win the next race.

- The parts cost about $250 to $300 and take 2 hours to assemble.

Oh. My. Gosh! This gobsmacked me! Donkey Car touches a lot of tech areas - 3D printing, computers, neural nets, a bit of radio communications, and best of all, things that move. It immediately became apparent that this will have enormous appeal to young folks, and I'm going to try to get something going around this for the Bellingham Makerspace. Thank you very much W6MRR!

Closing The Channel

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Thanks for reading!
Steve Stroh N8GNJ
Bellingham, Washington, USA
2021-10-29
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Below is a much more complete "footer" that has evolved over 30+ issues of ZR.

Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, here are some pointers:

- **Ham Radio for Dummies** by Ward Silver N0AX is a great overview of Amateur Radio. N0AX is a gifted writer and HRFD is now in its 4th edition.
- My two favorite **YouTube** channels for a good overview of Amateur Radio are AmateurLogic.TV. and Ham Nation (part of Ham Radio Crash Course). These folks just seem to have so much fun!
- Radio Amateur Training Planning and Activities Committee (**RATPAC**) offers weekly presentations on general Amateur Radio topics (Wednesdays) and emergency communications in Amateur Radio (Thursdays).
- Dan Romanchik KB6NU offers a free **No-Nonsense Study Guide** for the Technician test (PDF).
- HamExam.org Amateur Radio Practice Exams offers good **Flash Card and Practice Exams**.
- When you're ready to take an **Amateur Radio examination** (Tech, General, or Extra), W1MX - The MIT Amateur Radio Society offers remote exams, free for students and youngsters. *There are apparently many other remote exam options*.

Bonus - with an Amateur Radio license, you'll be more attractive on dates 😀

Closing the Channel

- In its mission to grow Amateur Radio and make it more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to anyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex!

- My ongoing Thanks to Tina Stroh KD7WSF for, well, *everything* and Bill Vodall W7NWP as *Zero Retries Instigator in Chief*.

- My ongoing Thanks to pseudostaffers Dan Romanchik KB6NU and Jeff Davis KE9V for continuing to spot, and write about "Zero Retries Interesting" type items, on their respective blogs, from Amateur Radio and beyond, that I don't spot on my own.

- Southgate Amateur Radio News consistently surfaces "Zero Retries Interesting" stories.

- The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

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More bits from Steve Stroh N8GNJ:

- SuperPacket blog - *Discussing new generations of Amateur Radio Data Communications - beyond Packet Radio (a precursor to Zero Retries)*

- N8GNJ blog - *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs - Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ (He / Him)
These bits were handcrafted in beautiful Bellingham, Washington, USA

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